AIR FORCE
QUALIFICATION TRAINING PACKAGE (AFQTP)

FOR

STRUCTURAL

(3E3X1)

MODULE 19

MASONRY CONSTRUCTION AND MAINTENANCE

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MODULE 19

MASONRY CONSTRUCTION AND MAINTENANCE

Career Field Education and Training Plan (CFETP) references from 1 August 2002 version.

OPR: HQ AFCESA/CEOF
(SMSgt Dan Sacks)
Supersedes AFQTP 3E3X1-18, 14 Jul 00

Certified by: HQ AFCESA/CEOF
(CMSgt Myrl F. Kibbe)
Pages: 18/Distribution F

AIR FORCE QUALIFICATION TRAINING PACKAGES
FOR
STRUCTURAL
(3E3X1)

INTRODUCTION

Before starting this AFQTP, refer to and read the "AFQTP Trainer/Trainee Guide"

AFQTPs are mandatory and must be completed to fulfill task knowledge requirements on core and diamond tasks for upgrade training. ***It is important for the trainer and trainee to understand*** that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.

MANDATORY minimum upgrade requirements:

Core task:
AFQTP completion
Hands-on certification

Diamond task:
AFQTP completion
CerTest completion (80% minimum to pass)

Note: *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location*.

Put this package to use. Subject matter experts under the direction and guidance of HQ AFCESA/CEOF revised this AFQTP. If you have any recommendations for improving this document, please contact the Career Field Manager at the address below.

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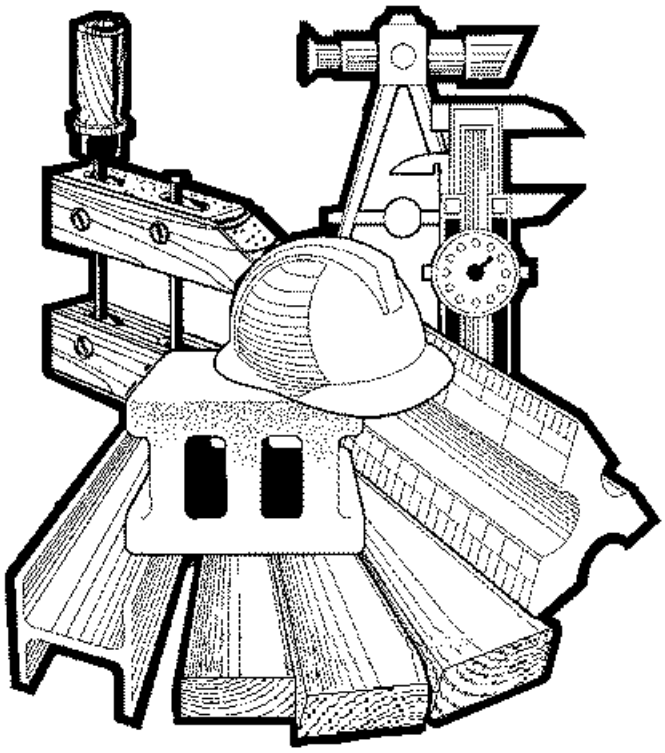
Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.



MORTAR

MODULE 19 **AFQTP UNIT 1**

MIX MORTAR (19.1.2.)

MIX MORTAR

Task Training Guide

STS Reference Number/Title:	19.1.2. - Mix mortar.
Training References:	1. Career Development Course (CDC) Structural Journeyman 3E351C, Volume 2, Unit 3, Section 3-1; *Select and Lay Building Block*. 2. Commercial Manual, *Modern Masonry by Clois E. Kicklighter, 1991*. 3. Navy Advancement Training (NAVEDTRA) Course 14043, *Builder 3 & 2, Volume 1.* 4. Masonry Block Explained by Bergwall Productions, Commercial Video Tape # 2, *Mortar: Mixing & Spreading.*
Prerequisites:	1. **Possess as a minimum a 3E331 AFSC**. 2. **Review the following references:** 2.1. CDC Structural Journeyman 3E351C, Volume 2, Unit 3, Section 3-1. 2.2. Modern Masonry, Chapter 4, Mortar, page 59 – 63. 2.3. Bergwall Video Tape # 2 (if available). 2.4. NAVEDTRA 14043, Chapter 8, Masonry.
Equipment/Tools Required:	1. Mortar mixer. 2. Mortar hoe. 3. Shovel. 4. Cubic foot measuring box. 5. Safety shield/glasses. 6. Hearing protection.
Learning Objective:	Trainee should be able to mix mortar to an adequate consistency.
Samples of Behavior:	Trainee will know the different types of mortar and how to mix them.
Notes:	
1. Any safety violation is an automatic failure. 2. This task needs to be accomplished with Unit 2, Lay Masonry Block (19.2.2.).	

MIX MORTAR

1. Background. As a Structural Journeyman, you may be tasked to lay block, brick or some other masonry material during your career. Not only does the quality of work depend on your skill in laying masonry units, it depends on how well these units are bonded together. Mortar serves as the bonding agent used to hold or tie together masonry units. It generally consists of cementious materials mixed with sand and water. The two basic cement types used for mortar are Portland and Masonry cement. Just as there are certain cements, there are also certain type of sand and water. Masonry sand (very fine sand with little or no rock) and potable water should be used with both mixes. Remember, just as the three little pigs needed a strong brick house, you need your project to withstand the rigors of life.

2. Mixing Mortar.

2.1. The following table describes different mixing amounts for different service conditions. This table is only a guide and should be used in conjunction with other training references.

TYPE OF SERVICE	CEMENT	HYDRATED LIME	MORTAR SAND
Ordinary	1 unit masonry cement or 1 unit Portland cement	$^1/_2$ to 1-$^1/_4$ units	2-$^1/_4$ to 3 units or 4-$^1/_2$ to 6 units
Heavy loads, violent winds, or severe frost action.	1 unit masonry cement plus 1 unit Portland cement or 1 unit Portland cement	0 to 1/4 units	4-$^1/_2$ to 6 units or 2-$^1/_4$ to 3 units

2.2. The manner in which mortar is mixed has much to do with the final product. You should place all the dry materials into the mixer first, mixing them for at least 1 minute before adding water. Add the water slowly to avoid splashing. Mix the mortar for a minimum of 3 minutes; be sure a completely uniform mixture is achieved.

3. Procedures. Follow these steps to mix motar:

NOTE TO TRAINER/CERTIFIER:
Accomplish this unit in conjunction with Unit 2. Trainee must estimate and mix enough mortar for the Unit 2 project.

Step 1: Calculate amount of dry ingredients for project. Refer to NAVEDTRA 14043, Builder 3 & 2, Volume 1, for guidance.

Step 2: Conduct a pre-start operational check on the mixer.

2.1. Check oil and fuel levels.

2.2. Lubricate all parts with grease fittings.

2.3. Start mixer and engage drum.

Step 3: Charge the mixer. Add the correct amount of dry ingredients to the mortar mixer and mix the recommended time.

NOTE:
Refer to the manufacturer's instructions for the specific mortar mixer used.

Step 4: Add water to the mixer. Add the desired amount of water to the mixer until the desired consistency is obtained. Mix the recommended time.

Step 5: Check consistency. Disengage the clutch ensuring the paddles have stopped. Check the consistency and empty into the appropriate container.

Step 6: Clean mixer and tools.

REVIEW QUESTIONS
FOR
MIX MORTAR

QUESTION	ANSWER
1. The two types of cement are Portland and Masonry.	a. True. b. False.
2. Beach sand is recommended for use in mortar?	c. True. a. False
3. When performing services in conditions where severe frost is prevalent, how much hydrated lime should be added when mixing one part Portland cement?	a. 1 part. b. 0 to ¼. c. ¾. d. Any of the above.
4. What is the minimum mixing time when mixing mortar?	a. 2 minutes. b. 3 minutes. c. 1 minute. d. 5 minutes.

MIX MORTAR

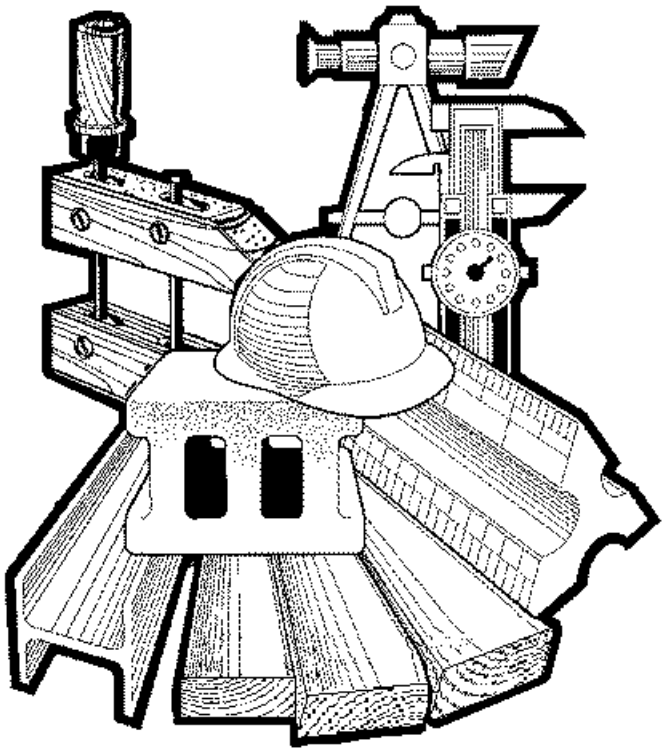
PERFORMANCE CHECKLIST

INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

DID THE TRAINEE….	YES	NO
1. properly calculate the amount of dry ingredients needed for the project?		
2. use the proper amount of materials in the mix?		
3. mixed together all the dry materials before adding the water?		
4. use the correct type of sand when mixing the mortar?		
5. mix the mortar the correct amount of time after adding water?		
6. obtain the desired consistency?		
7. clean all tools and equipment?		
8. comply with all safety requirements?		

FEEDBACK: Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.



LAY MASONRY UNITS

MODULE 19 AFQTP UNIT 2

BLOCK (19.2.2.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

LAY MASONRY BLOCK

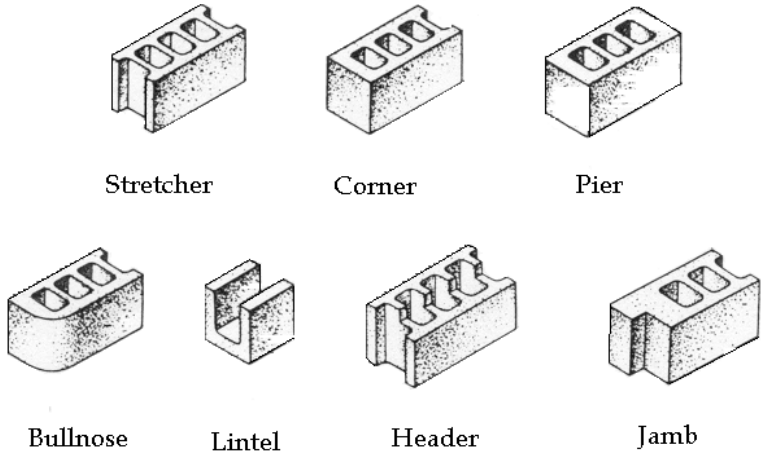
Task Training Guide

STS Reference Number/Title:	19.2.2. – Lay masonry units, block.
Training References:	1. Career Development Course (CDC) Structural Journeyman 3E351C, Volume 2, Unit 3, Section 3-1; *Select and Lay Building Block*. 2. Commercial Manual, *Modern Masonry by Clois E. Kicklighter, 1991*. 3. Navy Advancement Training (NAVEDTRA) Course 14043, *Builder 3 & 2, Volume 1.* 4. Masonry Block Explained by Bergwall Productions, Commercial Video Tape # 3, *Corner Construction* and Video Tape # 4, *Wall Construction*.
Prerequisites:	1. **Possess as a minimum a 3E331 AFSC**. 2. **Review the following references:** 2.1. CDC Structural Journeyman 3E351C, Volume 2, Unit 3, Section 3-1. 2.2. Modern Masonry, Chapter 8, pages 116 – 122. 2.3. Bergwall Video Tape # 3 and 4 (if available). 2.4. NAVEDTRA 14043, Chapter 8, Masonry. 3. **Complete AFQTP 3E3X1-19, Unit 1, Mortar, Mix Mortar (19.1.2.).**
Equipment/Tools Required:	1. Brick trowel. 2. Jointers (sled runner and S-shaped). 3. Brick hammer. 4. Brick chisel. 5. Story pole or folding rule. 6. Mason's level. 7. Construction line. 8. Chalkline. 9. Line blocks. 10. Mortarboard. 11. Mortar hoe. 12. Shovel. 13. Mortar mixer.
Learning Objective:	Individual should be able to lay and cut block for a required job.
Samples of Behavior:	Trainee will know the different types of block and which one to use for the required job.
Notes:	
Any safety violation is an automatic failure.	

LAY MASONRY BLOCK

1. Background. As mentioned in the previous unit, you may be tasked to lay block, brick or some other masonry material during your career. Now that you know how to properly mix mortar, you need to become proficient in laying the masonry units. One of the most common masonry units that you will be exposed to is the concrete block; also referred to as a concrete masonry unit (CMU). It consists of hardened cement and is made up of three classes: solid load-bearing, hollow load-bearing and hollow non-load-bearing. Concrete masonry units are usually laid by establishing corner leads, then filling in between the corners. Before you jump in and start laying the CMU, it is a good idea to become familiar with the different types and functions of each (Figure 2-1).

Figure 2-1. Block Types



2. Procedures. Follow these steps when laying concrete block:

> **NOTE TO TRAINER/CERTIFIER:**
> The following is the minimum required for upgrade if a block construction project is not available. Trainee must complete Steps 1 – 3 and 6. Steps 4 & 5 must be demonstrated step-by-step ensuring trainee has complete knowledge of tasks. For training purposes, use $3ft^3$ sand, $1ft^3$ lime and 1 shovel full of cement to tear down the corner lead.

Step 1: Layout building lines.

1.1. Attach a line to the batter boards so that it follows the building line.

1.2. Drop a plumb bob where the lines intersect to find the exact location of your first corner.

1.3. Snap chalk lines between corners for wall layout.

1.4. Check diagonals to ensure building is square.

> **NOTE:**
> If batter boards are not used, you can establish corners using the Pythagorean Method.

Step 2: Chasing the bond. Layout a dry course of block around the building perimeter to plan for any cuts and check the layout. Be sure to leave a $^3/_8$" joint between the blocks. Once you are satisfied with the layout, set the blocks to the side.

Step 3: Establish the corner leads (Figure 2-2).

3.1. Lay a full mortar bed for the first block.

3.2. Lay the corner block first and position it carefully.

3.3. Check block for level, plumb and correct height. Tap it with the trowel handle to make any adjustments.

3.4. After you lay the corner block, prepare the mortar bed and butter the ends of the next block.

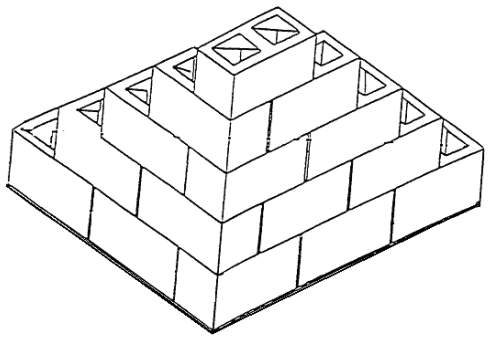
3.5. Hold the block over its final position and push it downward into the mortar bed from the previous course and against the previously laid block on the same course.

3.6. Repeat for adjacent blocks.

3.7. After you have laid the first three or four blocks, use your level as a straightedge to align them. Level and plumb the blocks by tapping them with the handle of your trowel.

NOTE:
Lay all the blocks with the wide web up to give a larger mortar bed for the next course. Build concrete block corners or leads three to five courses high before you fill in between the corners.

Figure 2-2. Corner Lead.



Step 4: Laying Stretcher Blocks. To fill in the wall between the corners, stretch a line from corner to corner and lay each block with the outside edge parallel to the line. Lay your mortar bed and butter each block like you did on the corner leads.

Step 5: Laying Closure Blocks. The closure block is the last block laid in a course. Butter all four sides, then lower it into position, making sure that none of the mortar falls off. If your closure block is too big, you might have to cut it. You can cut a block by using a brick hammer and a brick chisel; however, it is best to use a masonry saw.

Step 6: Tooling the Joints. You need to tool the joints to make them waterproof, uniform, and more attractive. Tool the horizontal (bed) joints first with a sled runner, and then do the vertical (head) joints with an S-shaped jointer.

REVIEW QUESTIONS
FOR
LAY MASONRY BLOCK

QUESTION	ANSWER
1. The most commonly used masonry unit is the concrete block.	a. True. b. False.
2. Stretcher blocks should be laid with the wide web down.	a. True. b. False.
3. The closure block is the last block laid.	a. True. b. False.
4. The vertical joint (head) is tooled first.	a. True. c. False

LAY MASONRY BLOCK

PERFORMANCE CHECKLIST

INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

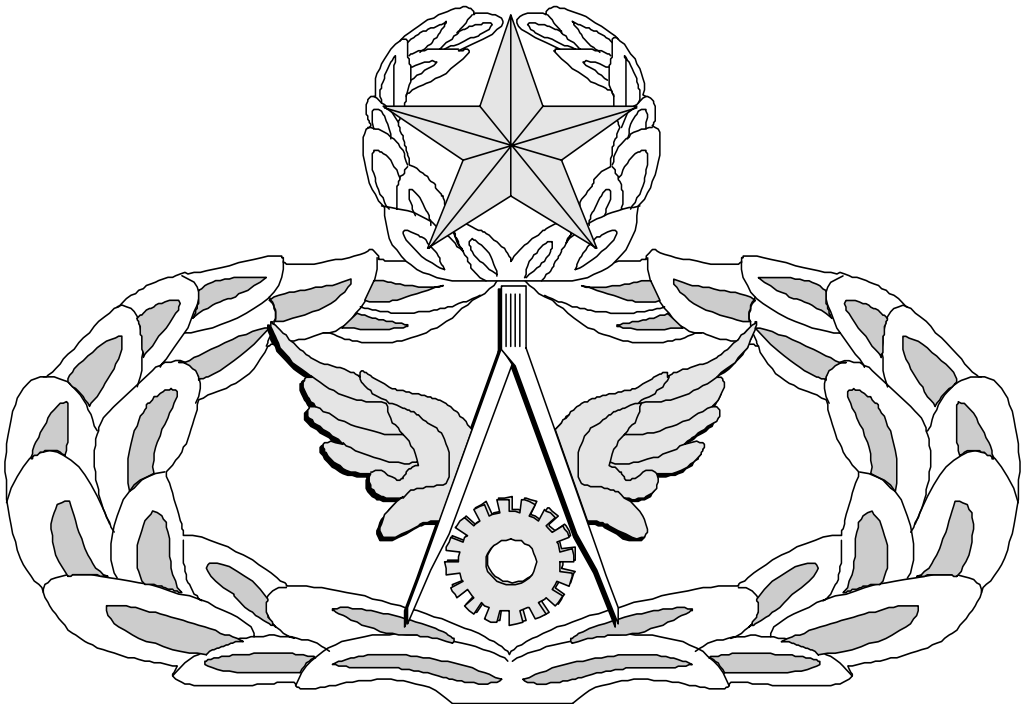
DID THE TRAINEE….	YES	NO
1. layout the building lines properly?		
2. chase the bond before laying block?		
3. build the corner leads plumb and square?		
4. make sure that the first course was straight and level?		
5. lay the stretcher blocks to the string line?		
6. ensure that all joints were $^{3}/_{8}$"?		
7. tool the joints in the correct sequence?		
8. comply with all safety requirements?		

FEEDBACK: Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.

Air Force Civil Engineer

QUALIFICATION TRAINING PACKAGE (QTP)

REVIEW ANSWER KEY



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STRUCTURAL

(3E3X1)

MODULE 19

MASONRY CONSTRUCTION AND MAINTENANCE

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MIX MORTAR
(3E3X1-19.1.2.)

QUESTION	ANSWER
1. The two types of cement are Portland and Masonry.	a. True.
2. Beach sand is recommended for use in mortar?	b. False
3. When performing services in conditions where severe frost is prevalent, how much hydrated lime should be added when mixing one part Portland cement?	b. 0 to ¼.
4. What is the minimum mixing time when mixing mortar?	b. 3 minutes.

LAY MASONRY BLOCK
(3E3X1-19.2.2.)

QUESTION	ANSWER
1. The most commonly used masonry unit is the concrete block.	a. True.
2. Stretcher blocks should be laid with the wide web down.	b. False.
3. The closure block is the last block laid.	a. True.
4. The vertical joint (head) is tooled first.	b. False

MEMORANDUM FOR HQ AFCESA/CEOF
139 Barnes Drive Suite 1
Tyndall AFB, FL 32403-5319

FROM:

SUBJECT: Qualification Training Package Improvement

1. Identify module.

   Module # and title_____

2. Identify improvement/correction section(s):

   _____ STS Task Reference
   _____ Training Reference
   _____ Evaluation Instructions
   _____ Performance Resources
   _____ Steps in Task Performance
   _____ Performance Checklist
   _____ Feedback
   _____ Format
   _____ Other

3. Recommended changes--use a continuation sheet if necessary.

   _____
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4. You may choose to call in your recommendations to DSN 523-6445 or FAX DSN/Commercial 523-6488 or (850) 283-6488 or email ceof.helpdesk@tyndall.af.mil.

5. Thank you for your time and interest.

YOUR NAME, RANK, USAF
Title/Position